

REMARKS

Claims 1-3, 12, 23-26, 77, 81 and 83 are all the claims pending in the application, prior to the present Amendment.

The Examiner states that claim 22 is considered to be withdrawn as it only depends from withdrawn claims. The Examiner also states that claim 81 is now a previously presented claim, and not a new claim, and that the status identifier needs to be changed to "previously presented." Applicants have changed the status identifiers for claims 22 and 81 in accordance with the Examiner's comments.

Claim 1 has been objected to since organic polymer (Al) is claimed as having silicon-containing functional groups each having three or more hydrolyzable groups on one or more silicon atoms, while at the same time, organic polymer (Al) is claimed as being a trimethoxysilyl or triethoxysilyl group. The Examiner states that applicants should remove the more generic limitation of component (Al) from instant claim 1 for clarity. In response, applicants have amended claim 1 as set forth above in accordance with the Examiner's comments.

Claims 1, 2, 12, 23, 24, 26, 77, 81 and 83 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. 4,910,255 to Wakabayashi et al.

In addition, claim 3 has been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. 4,910,255 to Wakabayashi et al in view of U.S. Pat. 6,703,442 to Ando et al.

Applicants submit that Wakabayashi et al et al and Ando et al do not render obvious the present claims and, accordingly, request withdrawal of these rejections.

Applicants have amended claim 1 by incorporating the subject matter of claim 3. Applicants have canceled claims 3, 77 and 83.

The present invention as set forth in claim 1 as amended above is directed to a curable composition comprising comprising an organic polymer (A1) having one or more silicon-containing functional groups capable of cross-linking by forming siloxane bonds in which the one or more silicon-containing functional groups capable of cross-linking by forming siloxane bonds each are a trimethoxysilyl group or a triethoxysilyl group, wherein the silicon-containing functional groups are located at the terminals of the molecular chain of the organic polymer (A1); and a component which is a silicate (B) and further comprising a tin carboxylate (C) in which the α -carbon of the carboxyl group is a quaternary carbon atom.

Thus, the curable composition of the present invention employs a combination of an organic polymer (A1) having a trimethoxysilyl group or a triethoxysilyl group at the terminals of the molecular chain, a silicate (B) and a tin carboxylate (C) having a specific structure to provide an unexpected effect, that is, excellent curability and recovery properties.

In order to demonstrate the effect of the combination, applicants enclose an executed Declaration Under 37 C.F.R. § 1.132.

As set forth in the Declaration, the curable composition of the present invention includes the organic polymer (A1) having a trimethoxysilyl group or a triethoxysilyl group at the terminals of the molecule chain, and the silicate (B), and therefore, has excellent curability and provides a cured product with excellent recovery properties.

The reason why the combination provides a cured product with excellent properties is assumed as follows.

The organic polymer having an alkoxysilyl group undergoes hydrolysis of an alkoxysilyl group to change into a silanol group, followed by a condensation reaction to form a siloxane

bond. In the curing reaction, the siloxane bond functions as a crosslinking point, which proceeds during the curing reaction. The mechanism of curing is thus suggested.

The siloxane bond is easily cleaved by hydrolysis, to form a silanol group. See the attached copy of page 671 of "Encyclopedia of Polymer Science and Engineering," Volume 4. The thus-formed silanol group is able to form siloxane group by re-coupling. Thus, the siloxane bond-forming reaction is a reversible reaction. In the presence of moisture, cleavage of siloxane bond and re-coupling are repeated.

Here, when tensile stress or compressive stress acts on a cured product, two Si groups generated by the cleavage of siloxane bonds separate from each other, and then each of the Si groups recouples to another Si group. As a result, the cured product deforms, and cannot recover to the original shape, that is, the cured product shows a low recovery property.

On the contrary, if two siloxane bonds are present between the Si groups of these crosslinking points, Si groups of the crosslinking points tend to stay in the original position. Furthermore, if three siloxane bonds are present between the Si groups of these crosslinking points, such tendency further increases.

Thus, an organic polymer having three alkoxyisilyl groups provides a cured product with excellent recovery property.

The same shall apply to Si compounds such as trialkoxyisilyl silane and tetraalkoxyisilane (silicate), which can function as crosslinking agents of an organic polymer having alkoxyisilyl groups. It is assumed that Si compounds having three alkoxyisilyl groups have stronger crosslinking points than those having two alkoxyisilyl groups. It is also assumed that Si compounds having four alkoxyisilyl groups have stronger crosslinking points than those having three alkoxyisilyl groups.

The curable composition of the present invention further includes a tin carboxylate (C), as a curing catalyst, in which the α -carbon atom of the carboxy group is a quaternary carbon atom. Thus, the curable composition shows particularly excellent curability.

Consequently, it is by the selection of the combination of the organic polymer (A1) having a trimethoxysilyl group or a triethoxysilyl group at the terminals of the molecule chain, the silicate (B), and the tin carboxylate (C) having a specific structure that the present invention satisfies both excellent curability of the curable composition and recovery property of the cured product produced therefrom.

On the other hand, Wakabayashi et al teach a curable composition which includes a reacting silicon group-containing organic polymer and a Si compound represented by the below formula (1):



(wherein n is an integer of 1 to 4, or a condensate thereof.)

Ando et al teach a curable composition which includes a hydrolyzing silyl group-containing compound and a bivalent tin-type curing catalyst.

Here, Wakabayashi et al disclose at column 12 a great number of Si compounds as representative examples, including a silicate. Wakabayashi et al neither teach nor suggest the knowledge that different Si compounds produce curable compositions with different curability and cured products with different recovery property. Thus, it is difficult to select a silicate as a Si compound among such a great number of Si compounds as disclosed in Wakabayashi et al to improve curability of curable compositions and recovery property of cured products.

Particularly, as set forth in the Declaration, a combination of an organotin catalyst, which is one of common curing catalysts and exemplified by Wakabayashi et al, and a silicate merely

produced a curable composition with lower curability than a combination of the same organotin and another Si compound. See Experiment Nos. 7 and 8 in the Declaration. Thus, Wakabayashi et al do not provide any motivation for one of ordinary skill in the art to select a silicate as a Si compound to achieve excellent curability and recovery property.

Ando et al teach tin octylate, tin naphthenate, tin stearate and tin versatate as examples of divalent tin curing catalysts. See column 7, lines 19-20. Ando et al further teach that tin dioctylate is preferable because the curing speed can be controlled easily. See column 7, lines 38-44.

Ando et al do not provide any motivation for a person of ordinary skill in the art who desires a curable composition with excellent curability to select a tin carboxylate (C) in which the α -carbon atom of the carboxy group is a quaternary carbon atom, such as tin versatate.

Considering the above circumstances, applicants submit that one of ordinary skill in the art could not expect that the specific curing composition which includes a combination of the organic polymer (A1) having a trimethoxysilyl group or a triethoxysilyl group at the terminals of the molecule chain, the silicate (B), and the tin carboxylate (C) in which the α -carbon atom of the carboxyl group is a quaternary carbon atom attains excellent curability and provides a cured product with excellent recovery property based on the teachings by Wakabayashi et al and Ando et al who disclose a great number of compositions.

Thus, the curable composition of the present invention is not obvious over Wakabayashi et al and Ando et al.

In view of the above, applicants submit that Wakabayashi et al et al and Ando et al do not render obvious the present claims and, accordingly, request withdrawal of these rejections.

Claims 1, 12, 23, 25, 26, 77, 81 and 83 have been rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Pat. 6,207,766 to Doi et al.

In addition, claim 3 has been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. 6,207,766 to Doi et al in view of U.S. Pat. 6,703,442 to Ando et al.

Further, claim 24 has been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. 6,207,766 to Doi et al, as applied to instant claim 1 above.

Applicants submit that Doi et al and Ando et al do not anticipate or render obvious the present claims and, accordingly, request withdrawal of these rejections.

Doi et al teach a curable composition which includes an organic polymer having a trialkoxysilyl group, and a dehydrating agent such as vinyltrimethoxysilane, tetramethoxysilane, and tetraethoxysilane.

Doi et al neither teach nor suggest improvement in curability of a curable composition which includes a silicate such as tetramethoxysilane or tetraethoxysilane, and an organic polymer having a trialkoxysilyl group in combination and improvement in recovery property of cured product produced therefrom, compared with the case of a composition containing vinyltrimethoxysilane (Experiment 4 of the Declaration containing component A-171) and an organic polymer having a trialkoxysilyl group in combination, as set forth in the Declaration.

Ando et al do not provide, as mentioned above, any motivation for one of ordinary skill in the art who desires a curable composition with excellent curability to select a tin carboxylate (C) in which the α -carbon atom of the carboxy group is a quaternary carbon atom.

Considering the above circumstances, one of ordinary skill in the art could not expect that the specific curing composition which includes a combination of the organic polymer (Al) having a trimethoxysilyl group or a triethoxysilyl group at the terminals of the molecule chain,

the silicate (B), and the tin carboxylate (C) in which the α -carbon atom of the carboxyl group is a quaternary carbon atom attains excellent curability and provides a cured product with excellent recovery property based on the teachings by Doi et al and Ando et al who discloses a great number of compositions.

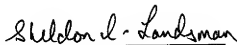
Thus, the curable composition of the present invention is not obvious over Doi et al and Ando et al.

In view of the above, applicants submit that Doi et al and Ando et al do not anticipate or render obvious the present claims and, accordingly, request withdrawal of these rejections.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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